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REVIEWS.

Muscular Homologies.*—It is now nearly a century (1774) since Vicq d' Azyr made the first detailed comparison between the anterior and posterior limbs; in doing which he was truly said to have "founded a new kind of comparative anatomy involving a study of the relations which exist between different parts of the body of the *same animal*." His special method of comparison was very defective and has been followed by few; but his general idea of the limbs as similar and *parallel* parts which repeat each other in a *serial* manner one behind the other, has been adopted by nearly all those who have since examined the subject; the exceptions being Gerdy, Foltz, Wyman, and three of the latter's pupils, Folsom, Coues, and the writer of this notice; all these have recognized a *symmetrical* relation between the anterior and posterior regions of the body and the limbs, which was first clearly and impartially discussed by "the most accomplished as well as the most distinguished anatomist of this country,"† three years before the present series of papers began to appear.

Dr. Coues's first paper is occupied with a very clear and intelligible discussion of the general ideas involved in the subject; clear, that is, to those who are already familiar with the "tools of thought" peculiar to this department of knowledge, which is sometimes, with a shade of derision, called "transcendental" anatomy; Dr. Coues accepts the adjective in so far as it expresses "the transcendent importance of investigations that can alone bring order out of a chaotic mass of observed facts, and make a philosophy of anatomy possible." There was some ground for the ridicule heaped upon Oken and Carus and St. Hilaire, who were the pioneers in this, till then unbroken, wilderness of homologies; no wonder the marvellous things which they for the first time beheld, so charmed and excited them that they became, as it were, intoxicated with new ideas, and painted what they saw in fantastic and impossible shapes; even in later times there is much that is apparently if not really fanciful in the views of the great English anatomist, whose archetype skeleton made each man a "potential Briareus as to limbs," and it is doubtless true that other cultivators of this field of anatomy have become so entangled in the complicated machinery of their own devising, as to see in the fruitful soil only stones to be cast out, stumps to be uprooted and streams of error to be turned from their channels; all of them facts, for which "so much the worse if they do not accord with my theory."

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*Antero-posterior Symmetry, with especial reference to the Muscles of the Limbs. By Elliott Coues, A.M., M.D., Ph.D., Assistant Surgeon United States Army. The Medical Record, N. Y., June 1st, July 1st, July 15th, August 15th, September 1st, October 1st, October 15th, 1870.

† On Symmetry and Homology in Limbs. By Jeffries Wyman. Proc. Bost. Soc. Nat. Hist., June, 1867.

But the last ten years have brought new laborers into the harvest; crude anatomical speculations have been gradually corrected by the severe criteria of embryology, and such men as Gegenbauer in Germany, Cleland and Flower, Huxley and Humphrey, Mivart and Parker* in England, are carefully reviewing all previous works and sifting the grains of truth from the Okenian chaff. Indeed, the science of homologies now fills more or less space in every anatomical periodical, and here in America we are encouraged to this kind of research not only by the general bearing of the works of Agassiz, Dana, and Wyman, but in particular by the paper on "Symmetry and Homology," above named.

In his second paper, Dr. Coues considers the symmetrical homology of the bones of the limbs and adopts the determinations of Prof. Wyman with queries respecting the correspondence of the shoulder and pelvic girdles; a subject which now demands careful revision in the light of Parker's splendid monograph.† The most important of these determinations is one upon which, in fact, the whole matter rests, or which rather expresses the result of the entire investigation, viz.: that the little finger (minimus) is the symmetrical homologue of the great toe (hallux or protos), on the ground of their relative position upon the inner borders of hand and foot respectively, when the former is supinated and brought into its more normal position.

That this is the true morphological way of comparing the hand and the foot, and that the difference in the *numerical composition* of the thumb and little toe would be of very little morphological consequence, even were it constant in the vertebrates, was first, so far as we know, insisted upon by the writer of this notice in a brief communication in 1866* which Dr. Coues appears not to have seen; we allude to it here from our sincere conviction that the recognition by anatomists of the morphological inconsequence of numerical composition as compared with relative normal position will not only aid the solution of many other problems in homology, but will especially enable us to remove what Professor Wyman, as late as 1867,† regards as "the greatest difficulty in the way" of those who adopt a symmetrical homology of the limbs.

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*The late Prof. Goodsir devoted much time to morphological investigations.

†Structure and development of the Shoulder-girdle and Sternum. W. Kitchen Parker. Ray Society, 1868.

The third paper opens as follows: "From what has preceded, it is evident that corresponding muscles are to be sought upon antitypically (or symmetrically) correlated aspects of the limbs, and determined mainly by relation;" but the difficulties found in the application of the principle to the bones are increased tenfold by the complexity of the muscular apparatus, and, at the outset, the author is forced to admit the present impossibility of making satisfactory determinations of the muscles acting upon the humerus and the femur; the *triceps humeralis*, however, and the *quadriceps femoralis* are seen to be homologous in the light of symmetry, even more clearly than they have been previously with the common idea of serial homology; Owen and Goodsir, being apparently the only anatomists who have denied this correspondence.

The outer and inner ham-string muscles give much trouble both on account of their number and their origin from the pelvis, and Dr. Coues finds himself obliged to dissent from previous determinations of their relation to the two flexor muscles of the fore-arm (*biceps* and *brachialis anticus*); his discussion of the homologies of these muscles and of the *poplitœus*, and that respecting the *latissimus dorsi*, and the *supinator longus*, are admirable examples of pure morphological argument, and while the reviewer is not yet fully convinced of the correctness of the conclusions upon these and other mooted points, he is ready to acknowledge, that the general presentation of the muscular homologies is far more ably and fairly presented in this series of papers than in the memoir‡ to which their author so kindly refers; which, by the way, like most theses of anatomical beginners, attempted to cover too much ground, and really accomplished only one thing, the statement of the law of

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* On a Cat with Supernumerary Digits. Proc. Bost. Soc. Nat. Hist., May 16th, 1866.

† Op. cit. p. 276.

‡ On Morphology and Teleology. Mem. Bost. Soc. Nat. Hist., vol. 1.

"long" and "short" muscles. Dr. Coues alludes in several places to the necessity of distinguishing between single muscles or muscular organs in different animals, and the muscular "morphological integers" which really ought to be determined before any final decision can be reached respecting symmetrical homologies in the muscular system. He recognizes the fallacy of conclusions drawn from the structure of that singular animal, man, who is in one place described "as the only true biped; no brute has such shoulder-pads, no brute such buttocks." He accepts the reviewer's suggestion* that the present *flexores* and *extensores carpi* are morphologically *extensores* and *flexōres* respectively. He also adopts the opinion of Wyman and others, that the patella is a "Sesamoid" bone; but he unfortunately also adopts unquestioned the Owenian theories of the vertebrate skull, and the morphological position of the scapular arch, which are now to be regarded as doubtful, if not altogether disproven.

We have not space here for a detailed account of the author's determinations; the result of the investigation may be given in his own words: "few muscles have not been shown to have correlatives in the opposite limb; of some of these now seeming to have none, correlatives will probably be found; some of the correspondences here laid down are obscure or doubtful; some others are provisional, subject to further revision; most are demonstrably symmetrical, and have been demonstrated so to be."

We would call attention to the very apt and striking comparisons often made by the author; as, for instance, when the stunted caudal segments are styled "*larval*" vertebræ, and the cranial segments "*neural imagines.*"

But there are a few matters of general interest connected with these papers which ought not to pass unnoticed. First, they appear in a strictly medical journal, and this may pave the way for discussions which must aid both the practitioner and the morphologist; for the principles of symmetry have already been shown to underlie many of the phenomena of disease in men and animals; and there must be constantly occurring cases which will illustrate and confirm or correct the ideas drawn from pure anatomy. Second, the papers themselves evince a closeness of anatomical observation and a logical power, which promise well for the future of philosophical anatomy in America. And third, these papers are absolutely free from covert flings and sarcasms at opposing theories, and their author has done ample justice to the labors of those whose works he has employed; we must regret the lack of reference to other, and later papers upon limb-homologies, especially those in the "Journal of Anatomy and Physiology." But this was to some extent unavoidable with one who is serving in the army, and is at least atoned for in one way by the assiduity with which the author has made dissections of animals which he could procure. *

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* Comparative Myology of the Chimpanzee. Bost. Jour. Nat. Hist. 1861. p. 363.

This hasty notice has done scant justice to Dr. Coues's work. Let us urge upon all, who are, or wish to be interested in the study of homology, to read this series of papers; we hope before long to publish elsewhere † a more complete review of these productions of our morphological brother; to include therewith a notice of the remarkable paper of Professor Wyman, who is in limb-homologies our common progenitor; to add some suggestions respecting terminology as to both the objects of our study, and the ideas involved therein; to indicate as far as possible, the various minor problems which will occupy us for the half century prior to the probable acceptance of these views by all anatomists; and finally, to append a list of all works and papers bearing upon the question of the homology of the anterior and posterior limbs of vertebrate animals.—B. G. WILDER.

FORMS OF ANIMAL LIFE. ‡—In its plan, arrangement, and the great mass of details and its useful illustrations, this work on comparative anatomy, is the most convenient manual we now have in the English language. Were we going away from libraries, for a sojourn by the sea-side to pursue anatomical studies, we should take with us Gegenbaur's incomparable "Grunzüge der Vergleichenden Anatomie" (Principles of Comparative Anatomy), Huxley's "Introduction to the Classification of Animals," and his "Elementary Lessons in Physiology," but if deprived of these, and one book was to do the work of all, our choice would be Professor Rolleston's excellent compendium.

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* The Opossum and the Ornithorhyncus, among others, have received Dr. Coues's attention and were especially useful in this particular line of research.

† American Journal of Science and Arts.

‡ Forms of Animal Life. Being Outlines of Zoological Classification based upon Anatomical Investigation and illustrated by Descriptions of Specimens and of Figures. By George Rolleston. Oxford, 1870. 8vo. pp. clxviii, 268.